NEW RIVER VALLEY PLANNING DISTRICT COMMISSION

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April 14, 2004

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RE: Commission Comment on Peak Creek, Crab Creek, and Back Creek Draft TMDLs

At the March 25 Commission Meeting, the results of the draft Peak Creek, Crab Creek, and Back Creek Draft TMDLs was reviewed. The following finding and comments are offered by the Commission:

Findings

The Bacterial Source Tracking studies conducted to determine the sources of pollution levels in Crab Creek, Back Creek, and Peak Creek resulted in the following table. Clearly, the sources are divided among four sources, wildlife, human, livestock and pets. All of the sources are associated with agriculture as well as other land uses.

Station ID	Stream	Wildlife	Human	Livestock	Pet
9PKC009.29	Peak Creek	33%	13%	32%	21%
9CBC001.00	Crab Creek	22%	25%	31%	22%
9CBC004.38	Crab Creek	32%	19%	28%	21%
9BCK000.74	Back Creek	15%	17%	43%	25%
9BCK009.47	Back Creek	25%	26%	25%	24%

These findings are utilized as the basis to establish recommendations for actions to be taken to reduce the levels of bacterial found in the water. None of the recommended implementation plans call for a reduction to be associated with wildlife.

Recommendation

The Commission encourages that an allocation be made for reduction in the wildlife contribution, allowing a reduction in livestock allocations. The management actions possible to reduce wildlife contributions include: extended deer hunting seasons, seasons in which allow both sex hunting throughout the season, youth seasons and others. These management actions may be achieved at little cost. This action can be utilized to reduce the allocations to livestock thereby creating a more equitable distribution of efforts to maintain water quality. Agricultural landowners provide a majority of the forage which sustains the Commonwealth's wildlife populations.

Sincerely,

David W. Rundgren

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Executive Director

MapTech

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Peak Creek Cu and Zn Model for TMDL **April 16, 2004**
Sensitivity Analysis

Client: Virginia Department of Environmental Quality
Attn: Jason Hill

A sensitivity analysis was performed on the Peak Creek stream sediment model developed in support of the Peak Creek General Standard (benthic) TMDL. Concentrations of metals (*i.e.*, Cu and Zn) in sources (*i.e.*, sediment, runoff, and permitted discharges) were varied and the responses of metal concentrations in the stream sediment at the outlet were recorded. The sources were defined as follows:

Enriched Background: Sediment delivered from areas that may have larger concentrations of metals due to historic mining operations. Base values were set to 50 mg/kg and 587 mg/kg for Cu and Zn, respectively.

COMMENT 1 - Sediment concentrations of copper and zinc from the upstream reference station were considerably higher than the base values used in this sensitivity analysis. This is particularly true of zinc. Reference station (9-PKC011-11) concentrations exceeded Probable Effect Concentrations (PECs) of 149 and 459 mg/kg for copper and zinc, respectively. The highest zinc reference sediment concentration was in excess of 3,500 mg/kg – approximately 6 times the highest concentration used in the sensitivity analysis. Therefore if this reference station was considered typical of "enriched" background sediment, it is likely that the sensitivity analysis underestimated the contributions.

Non-enriched Background: Sediment delivered from areas that are not anticipated to have unusually high concentrations of metals. Base values were set to 26 mg/kg and 60 mg/kg for Cu and Zn, respectively.

COMMENT 2 - Naturally occurring soil concentrations are greater than the concentration ranged used in the sensitivity analysis See comment on streambank below.

Contaminated: Sediment delivered from the only known contaminated site in the watershed (Allied Signal). Base values were set to 28,810 mg/kg and 20,810 mg/kg for Cu and Zn, respectively.

COMMENT 3 - These modeled soil concentrations used in this sensitivity analysis are at least an order of magnitude higher than actual analytical soil results from the former Allied Signal Site.

Streambank: Sediment from streambank erosion. Base values were set to 26 mg/kg and 60 mg/kg for Cu and Zn, respectively.

COMMENT 4 - These concentrations are less than "naturally occurring background" concentrations, particularly for zinc. EPA CERCLIS Database identified naturally occurring zinc levels up to 506 mg/kg with an arithmetic mean of 77 mg/kg. Similarly for copper, EPA identified copper concentrations up to 166 mg/kg with an arithmetic mean of 25.3 mg/kg.

Urban Runoff: Runoff from impervious urban areas. Base values were set to 43 µg/l and 228 µg/l for Cu and Zn, respectively.

COMMENT 5 - In a study, Field Monitoring and Evaluation of Stormwater Ultra-Urban BMP's (Shaw L. Yu, Monika D. Stopinski and Jenny X. Zhen, University of Virginia, sponsored by the Virginia Department of Transportation), sediment in storm drains of copper and zinc ranged from 28.1-136 and 62.5-953 mg/kg, respectively. Therefore, copper and zinc associated with stormwater runoff (aqueous and particulate) may be underestimated.

Point Sources: Discharge from permitted point sources in the watershed. Base values were set based on monitored concentrations 7 to 11 µg/l for Cu, and 25 to 1,274 µg/l for Zn.

Sediment delivered to the reference station was modeled with the concentrations measured in stream sediment at that station. This load was held constant for this analysis. This load and additional downstream loads of sediment and metals are mixed proportionally to establish the concentration of metals in stream sediments. For the sensitivity analysis, the concentrations of metals in the sources described above were individually adjusted up and down, and the responses of concentrations in stream sediment were recorded. The results of the sensitivity analysis are presented in Tables 1 and 2. Because the sediment delivered from contaminated areas has a higher concentration of metals, the model is considerably more sensitive to changes in these source concentrations.

The parameter used for calibration of the model was the enrichment ratio of sediment delivered from the contaminated site, because this is value cannot be specifically defined based on the available data, but is expected to be quite high, given the site conditions. Further justification for this approach is given by the sensitivity analysis. Because this is a calibrated model, the percentage variation in the modeled sediment concentrations can be viewed as error, which would require re-calibration if that particular change in the source concentrations was incorporated in the model. For instance, if the Cu concentration in sediment from the contaminated site was reduced by 50% with no other changes, the model would be under predicting the concentration of Cu in stream sediment by 46.1%. In order to compensate for this error, one method would be to increase the loads from other sources, but, as can be seen from the sensitivity analysis, the other source concentrations would have to be increased by well over 100%. With no justification for increasing these loads to this degree (*e.g.*, known areas of contamination),

COMMENT 6 - As noted in the comments to the Draft TMDL report, data from the Moeykens study showed that the stream segment between the reference station and the Former Allied site has the highest sediment concentrations of zinc. This would indicate that there is a substantial source/load of zinc upstream of the former Allied site that has not been accounted for in the model and provides justification for the increasing loads from other sources.

the most effective and logical parameter for calibration is the enrichment ratio of sediment delivered from the contaminated site. If this approach is used, then the change to the Cu concentration in sediment from the contaminated site has no net impact on model results or the resulting TMDL allocations.

COMMENT 7 - As indicated above, justification for decreasing the modeled soil concentration from the former Allied site is available as the measured soil concentrations are considerably less (up to an order of magnitude) than that used in the sensitivity analysis. While it is true from the sensitivity analysis of the calibrated model that reductions in the site input would underestimate sediment concentrations unless the loads were increased from other sources over 100%, there are uncertainties in all the loads from the identified sources (in addition to the fact that there is data that indicates that some other substantial sources were not considered in the model). This analysis points out that if the load from the former Allied site can be documented from monitored rather than model soil concentration (reducing the uncertainty in this input parameter), then the other input parameters would be suspect in the "under prediction" of the model. Other contributors are likely underestimated, particularly urban run off (particulate and aqueous) as well as enriched and non-enriched background sediment and other potential point sources. Therefore, the "calibration" of the model may be incorrect.

Table 1. Results of sensitivity analysis on source concentration of Cu for the Peak Creek stream sediment model.

	Change in Source Concentration (Cu)					
Source	**-100%**	**-50%**	**0%**	**50%**	**100%**	**1000%**
Enriched Background	-0.05%	-0.03%	0%	0.02%	0.05%	0.45%
Non-enriched Background	-3.10%	-1.55%	0%	1.55%	3.10%	27.9%
Contaminated	-92.1%	-46.1%	0%	46.1%	92.1%	829%
Streambank	-0.20%	-0.10%	0%	0.10%	0.20%	1.82%
Urban Runoff	-2.94%	-1.47%	0%	1.47%	2.94%	26.4%
Point Sources	-0.45%	-0.23%	0%	0.23%	0.45%	4.10%

Table 2. Results of sensitivity analysis on source concentration of Zn for the Peak Creek stream sediment model.

	Change in Source Concentration (Zn)					
Source	**-100%**	**-50%**	**0%**	**50%**	**100%**	**1000%**
Enriched Background	-0.35%	-0.18%	0%	0.17%	0.34%	3.16%
Non-enriched Background	-4.34%	-2.18%	0%	2.17%	4.34%	39.1%
Contaminated	-76.5%	-38.2%	0%	38.2%	76.5%	688%
Streambank	-0.28%	-0.14%	0%	0.14%	0.28%	2.55%
Urban Runoff	-9.46%	-4.73%	0%	4.73%	9.46%	85.1%
Point Sources	-1.27%	-0.64%	0%	0.63%	1.27%	11.38%

Comments on the Draft TMDL Report:
"Fecal Bacteria and General Standard Total Maximum Daily Load Development for Peak Creek, 18 March 2004"

Comment Number	Reference	Comment
1.	ES, p. xiii	The text refers to comparisons between the monitoring stations with a non-impaired reference station, however as indicated in detail below (Comment 5) the reference station has benthic scores that in Virginia would be classified as impaired, i.e. less than 61.5. In fact the mean score for the reference station is only 65.3. The characteristics of the reference station should be included in the report for a complete assessment.
2.	ES, p. xiv	The text references station 9-PKC007.82. Should this be 9-PKC007.80?
3.	ES, p. xv	In ecological risk assessment, it is important that causal association be assessed not mere coincidental occurrence. The existence of two conditions, e.g., the presence of metals and poor benthic community health, does not prove that the relationship is causal or a probable stressor. This qualification should be made. While it is true that if fecal bacteria sources are reduced, it is likely that other associated parameters, e.g., organic matter, may also be reduced, the elimination of organic matter and other constituents associated with fecal waste as possible stressors without evaluating the association may lead to false conclusions. For example, ammonia that is associated with organic matter and fecal bacteria is well known to be causally associated with impairment of benthic health. This limitation should be noted.
4.	ES, p. xvii	While Virginia has no criteria for metal concentration for sediment, it should be noted that naturally occurring background concentrations can exceed the sediment screening criteria, e.g., probable effect concentrations (PECs) used by Moeykens and also in the evaluation. In using the reference watershed approach, the site-specific metal concentrations that may produce adverse impacts on the benthic community is not being defined as the "benchmark" is being established as background not impairment. This limitation should be noted.

Comment Number	Reference	Comment
5.	Sections 6.1 -6.2	Specifically for Peak Creek, some of the reference SCI scores from the benthic assessment would be considered impaired according to the DEQ's criteria, i.e., scores less than 61.5. With the wide-ranging variation in the measurements making up the SCI for the individual stations (minimum to maximum, 25th and 75th percentile), the statistical and biological significance of the assessment is questionable. Based on the wide ranges of scores for the individual parameters that make up the SCI, there is a considerable amount of overlap between the two monitoring and one reference stations for some of the parameters attesting to the difficulty in ascertaining any biological significance, particularly to the general pattern described in the text. For example, high scores in taxa richness and EPT indicate a positive response in benthic health, while high scores in %MFBI and %2Dom is a negative response in benthic health. The highest median %MFBI and %2Dom scores were identified at the reference location. In order to identify the causal relationship(s) (probable stressors) of the impairment cited in the reference and two monitoring stations as indicated predominately by the decrease in numbers of intolerant species, other factors have been examined. EPA ecological risk assessments analyze effects by examining stressor-response relationships, the evidence for causality, and the relationship between measures of effect and assessment endpoints. Causality is the relationship between cause (one or more stressors) and effect (response to the stressor[s]). Without a sound basis for linking cause and effect, uncertainty in the conclusions of an ecological risk assessment is likely to be high (Guidelines for Ecological Risk Assessment, EPA/630/R-95/002F, April 1998). "A risk does not exist unless (1) the stressor has the ability to cause one or more adverse effects, and (2) it co-occurs with or contacts an ecological component long enough and at sufficient intensity to elicit the identified adverse effect" (Ecological Risk Assessment for Superfund Process for Designing and Conducting Ecological Risk Assessments, EPA, 540-R-97-006, June 1997). For example, the inverse relationship between stream biological integrity and watershed imperviousness has been well documented in the past decade (Boward et al, 1999). It has been shown that the threshold for maintaining biological integrity is generally reached between 10 to 20% impervious cover (Booth, 1991 and Booth and Reinelt, 1993). On page 6-2, the reference location impaired scores are cited as examples of the two trends, i.e., seasonality and drought conditions. However, the SCI scores do not appear to be associated with the drought conditions of 2000-2003. The text contains highly speculative interpretations of the limited biological monitoring data. For example, the text contains the interpretation of the data that the seasonality is less beginning in 2000 as demonstrated by the decline in SCI scores at most stations (most clearly at the reference station). First, whether or not there is seasonality at all is in question let alone as described in the text. The text indicates that the benthic community experiences seasonality with SCI scores generally higher in the fall than the spring. That does not appear to be the case for the reference and two biological monitoring systems. In fact, the highest SCI scores for all three stations appeared in the month of May and the lowest SCI scores for two of the three stations occurred in the October (the next to the lowest SCI score for the

Comment Number	Reference	Comment
5. (cont.)	Sections 6.1 -6.2 (cont.)	remaining monitoring station occurred in the month of October). Therefore, the seasonal trend cited in the text does not appear to be present or at least not as described in the text. Secondly, there are only two data points from the "drought period", i.e., 2000 to 2003. Two data points cannot be interpreted as a trend. In addition, beginning in 2000, there is not "a decline in SCI scores at most stations" as stated in the text. For the two monitoring stations, the scores increased between 2000 and 2002 while the reference station decreased. Based on these discrepancies in the text related to data interpretation and the high degree of variation between the individual parameters, as well as the concerns regarding the comparability of the reference station to the two monitoring stations, the relevance of the SCI scores, particularly when ascribing causality or "links", is dubious. The speculation that metals from the Allied-Pulaski site upstream of station PKC007.80 were responsible for impairment, based on "improvement" in SCI scores during the drought appears to be without technical merit and as such should be eliminated from the text. For Station PKC007.80, scores equal to or higher than that seen in the years 2000-2002 were previously recorded, e.g., May 1996 and 1997 and April 1998. If there was a causal relationship between lower SCI scores and site-related metals as described in the text, what is the explanation for the similar or higher scores recorded in the springtime, usually a time of increased precipitation and high water levels (and associated sediment disturbance)? In order to examine causal relationships between various factors an ordinary least-square simple linear regression analysis could be preformed as was done to show a highly significant statistical inverse relationship between % imperviousness with benthic health (Fairfax County Stream Protection Strategy, 1999). Both the reference and monitoring stations have shown improvement in benthic health as indicated by taxa richness, scraper to filtering collector ratio, EPT/Chiron ratio and EPT index. For example, the diversity of taxa has approximately doubled for all three locations from data in 1994 when compared to 2002. This should be noted in the text.
6.	Table 7.1	For the eight VPDES permit limits related to copper and zinc shown in this table, the data indicate that six of the permit limits are being substantially exceeded. This being the case, is the use of the permit limit in the model (as described on page 8-7) really representative of existing conditions? Wouldn't the actual discharge concentrations be more representative of existing conditions? Also see comment 28.
7.	Page 7-3	Considerable discussion is provided on the soil piles at Allied Signal site being a source of metals to the Creek via storm water runoff. . However, storm water runoff from the parking lot would add to the load both in metal concentration as well as other organic constituents.

Comment Number	Reference	Comment
8.	Page 7-5, Figure 7.2 Table 7.3	The text and table provides data on the benthic assessment for the two monitoring stations: 9-PKC009-29 and 9-PKC007.80 but fails to mention or provide the reference station assessment (9-PKC011-11). This should be included for a balanced assessment.
9.	Figures 7.3 to 7.11, .14 to 7.17	The x-axis is not labeled on these figures – please correct.
10.	Page 7-13	While the habitat scores for the two monitoring stations were discussed and described, the reference station habitat scores were not. As presented in Table 6.5 and Figures 6.6-6.8, the mean habitat score for all three stations were sub-optimal (scores 99-143).
11.	Page 7-18, Section 7.1.3.3	There is an error message in the text – please correct.
12.	Figure 7.18	The data would be more clearly represented if the monitoring stations are ordered from upstream to downstream, left to right.
13.	Table 7.5	The corresponding locations should be shown on a map with the other locations.
14.	Table 7.6	The data would be more clearly represented if the monitoring stations are ordered from upstream to downstream, left to right.
15.	Figure 7.19	VDEQ data for monitoring station 9-PKC009.29 indicates a range of copper concentrations of 36 to 157 mg/kg in sediments. The data used to generate this figure appears to be incorrect in that it shows a maximum concentration of greater than 3,000 mg/kg copper for this location. Please correct the figure.
16.	Figure 7.20	VDEQ data for monitoring station 9-PKC009.29 indicates a range of lead concentration of 41 to 140 mg/kg lead in sediments. The data used to generate this figure appears to be incorrect in that it shows a maximum concentration of greater than 2,000 mg/kg lead for this location. Please correct the figure.
17.	Figure 7.21	The x-axis on this figure is incorrectly labeled. Based on the VDEQ data, the x-axis should be labeled from left to right as follows: 9-PKC007.82, 9-PKC009.29, 9-PKC011.11. Also please clarify whether station 9-PKC007.82 is really 9-PKC007.82.

Comment Number	Reference	Comment
18.	Page 7-23	The monitoring station downstream from the Allied Signal site is identified as 9-PKC007.80 and 82. Are there two stations or is this a typographical error? If not, then the benthic data and sediment monitoring data for the downstream location are not consistent as the benthic data is cited as being from 9-PKC007.80 and as such no comparisons can be made as to links. However, if the data are from the same monitoring station and the sediment metal concentrations are the highest at this location, then it does not appear that there is a "dose-response" relationship to impairment of the benthic community as the scores are fairly consistent between the two monitoring stations (Table 6.1 and 6.2)
19.	Page 7-25	The text references sediment pore water samples collected by Moeykens (2002). In comparing the simultaneously extracted metals (SEM) data reported by Moeykens to the PEC screening values, the text incorrectly states the number of results for copper and lead that were above the PEC. The Moeykens data reported 3 SEM results for copper (not 8) that were above the PEC value of 149 mg/kg and 6 SEM results for lead (not 12) that were above the PEC value of 128 mg/kg. The text is correct for the zinc data. Please correct the text.

Comment Number	Reference	Comment
20.	Page 8-1	This TMDL utilized the reference watershed approach, selecting observed median metal concentrations in sediments from a reference (unimpaired) watershed as the TMDL endpoint. By using the reference watershed approach to set the TMDL endpoint, the challenging issue for developing sediment criteria may be "skipped". Are there any approved benthic TMDLs due to metals from contaminated sediment in Virginia to date? The results for sediment pore water samples, including simultaneously extracted metals (SEM, ug/g) and dissolved metal concentrations from pore water (ug/L) are available (e.g., on page 7-25). The presence of metals in the pore water (due to partitioning of metal between the sediment and pore water) is considered an indicator of bioavailability. Virginia Water Quality Standards have numeric limits for dissolved metals including copper and zinc. Why doesn't this TMDL directly use site-specific criteria of dissolved metal values in pore water as the TMDL endpoint (to compare against metal concentration from pore water of field sediment samples)? It seems the water quality criteria are more appropriate for this benthic TMDL due to contaminated sediment, because this is a very straightforward approach, with less complicating quantifiable ambient effects in water than for sediment. The reference watershed approach should only be an alternative when there is no numeric ambient water quality standard (e.g., for nutrient and "clean sediment" TMDLs). In general, benthic impairment due to metals in contaminated sediment is much more complicated than typical "clean sediment" TMDLs where the reference watershed approach has historically been used. The ecosystem/aquatic life's response to toxic metals between impaired and the selected reference watershed (from multiple candidate unimpaired watersheds) could be quite different, even if their land-based pollutant loadings are the same. The ambient bioavailability condition of metals (e.g., using the fractions of metals associated with acid volatile sulfides (AVS) as a measure) may not be comparable between the impaired and reference watershed. Without further detailed ambient sampling data for comparison (e.g., fractions of metal with AVS) in both the impaired and unimpaired watersheds, direct application of the reference watershed approach may have ignored certain key aspects of this complex problem and added significant uncertainty in the TMDL calculation. Therefore, choosing site-specific criteria of dissolved metal concentrations in pore water should be preferred over the reference watershed approach.
21.	Table 8.1	The table references the location of the monitoring station relative to the Allied Signal site. The table should simply list the reference station by name. A figure should be included illustrating the location of the monitoring stations and ALL potential sources, including Magnox and other permitted dischargers, the McCready Lumber site, etc.

Comment Number	Reference	Comment
22.	Page 8-1	The text states that there is "one area of well-documented contaminated soils in the Peak Creek watershed, Allied Signal". However, a VDEQ report dated September 21, 1998 entitled "Brownfields Site Screening Report, McCready Lumber (BFP-003), Town of Pulaski, Virginia" describes sampling performed by VDEQ at the McCready Lumber site, which is located along Peak Creek between monitoring stations 9-PKC009.29 and 9-PKC007.82. The McCready Lumber site was used to treat lumber with a copper chromated arsenate (CCA) preservative. The report describes 18 surface soil samples that were collected at the site in 1998. The Draft TMDL report does not mention this property. Was this property considered in the development of the TMDL? The median concentrations of Cu and Zn in sediment alone are not descriptive of the dataset including the variability. Based on the limited numbers of samples, the median concentration can be misleading as the value can be heavily influenced by an "outlier" and not be descriptive of the sediment quality. Demonstration of statistically significant differences between the zinc datasets would be problematic because of the variability and small data set. Therefore confidence in the data analysis is low and it should be noted.
23.	Table 8.1	The data presented in Table 8.1 is inconsistent with Figures 7.19-7.21. Specifically for zinc, when Figure 7.21 is labeled correctly, the median concentration at the reference station is above that of the station adjacent to the Allied Signal site (9-PKC009-29). Therefore, the median upgradient concentration of zinc is higher than that adjacent to the Allied Signal site.
24.	Table 8.2	The accompanying text states that the metal concentrations reported for the 7/26/02 sample collected by Honeywell were used in the MINTEQ speciation model. However, the values shown in the table for aluminum, cadmium, chromium, copper, iron, nickel, lead and zinc do not match the 7/26/02 sample results. Please correct the data or modify the text to provide the actual source for the data shown in Table 8.2 for these metals.
25.	Page 8-4	Please provide a reference/source for the surface water runoff volumes that were used.

Comments on the Draft TMDL Report:
"Fecal Bacteria and General Standard Total Maximum Daily Load Development for Peak Creek, 18 March 2004"

Comment Number	Reference	Comment
26.	Page 8-6	This section of the report describes the data that was used as input to the model for metals in sediment. Although data is available from the Moeykens study cited in the report, the report does not consider sediment concentrations between the reference station (9-PKC011.11) and the station adjacent to the former Allied site (9-PKC009.29). The Moeykens study identifies zinc concentrations at two locations (PK2 and PK3) between the reference station and the former Allied site that exceeded the hardness adjusted water quality criterion for surface water (PK2) and/or the PEC for sediments (PK2 and PK3). In fact, the two highest zinc concentrations in sediment were reported upstream of the former Allied site. This data indicates that there are substantial sources of zinc loading to Peak Creek between the reference station and the former Allied site. It does not appear that this data was adequately considered in the development of the TMDL (as it is not even mentioned). Therefore, substantial loading from sites in this segment of the creek (between 9-PKC011.11 and 9-PKC009.29) may be missing or severely underestimated in Table 8.10 "Existing Conditions of Cu and Zn in Sediment". See comment 28 also. Please incorporate this data into the TMDL development.
27.	Page 8-7, first paragraph	A wastewater treatment facility is located immediately upstream of monitoring station 9- PKC007.82. The USGS 7.5 minute quadrangle for Pulaski identifies two "sludge disposal" locations near this facility, along Peak Creek. Considering the potential concentrations of copper and zinc in municipal sludge as well as the discharge from the treatment plant itself, were these locations considered as potential loading sources in development of the TMDL? See comment 28 also.
28.	Page 8-7, first paragraph	The first paragraph states that loads from permitted point sources were based on Discharge Monitoring Reports. However, other than the information provided in Table 7.1 for the Magnox facility, the zinc and copper concentrations that were used for permitted point sources are not provided. In application, the ultimate success of reducing Cu and Zn loading may be compromised without consideration of these other sources based on the uncertainties in the modeling efforts. Please provide a table listing all of the point source dischargers as well as the associated zinc and copper concentrations. If zinc and copper are not reported from these facilities, please indicate this in the table. This table would be similar to Table 8.9, which shows the TSS loads from the point source dischargers and uses "N/A" if it is not applicable to that source. A similar table is also provided in the discussion of the fecal coliform TMDL.

Comment Number	Reference	Comment
29.	Page 8-7, second paragraph	The model input for copper and zinc soil concentrations at the former Allied site were back calculated from the aqueous concentrations reported for a water sample collected 7/26/02. The sample was collected approximately 150 feet from Peak Creek (i.e., not at the discharge point). The back-calculation resulted in model input concentrations for copper and zinc of 28,810 and 20,810 mg/kg, respectively. However, actual field data from an October 1998 EPA soil sample collected in approximately the same location indicated copper and zinc concentrations of 3,160 and 1,000 mg/kg, respectively. The EPA report describing these sample results is publicly available as part of the Administrative Record for the site at http://loggerhead.epa.gov/arweb. This actual data would be a more accurate input to the model, particularly since the modeled back-calculations of soil concentrations are approximately an order of magnitude or greater more than the acute site-specific data. The results of the sediment loading model with model-generated soil concentration input values equal to or greater than an order of magnitude greater than site-specific should be viewed with caution. Particularly when the loads modeled as being delivered from the Allied Signal site are an order of magnitude greater than the loads from any other site (Page 8-20). Per our conference call on April 6, 2004 with Dr. Jim Kern of MapTech and VDEQ representatives, the back-calculated concentrations were also used to calculate the enrichment ratio described on page 8-20. Dr. Kern explained that the enrichment ratio is used to describe how the concentrations in the soil would translate into concentrations in stormwater runoff discharged to the creek. Since the 7/26/02 sample results already describe both the total and dissolved concentrations of metals in stormwater at this location, why not use the actual data instead of introducing potential errors from back-calculating and estimation of an enrichment ratio? Dr. Kern agreed that this would be a more direct approach and stated that he would look into it. Please provide further explanation as to how this actual data will be used in the development of the TMDL. Furthermore, additional samples will be collected in the near future from the actual point of discharge to Peak Creek at this location. This data would be an even better input for the model, reflecting the actual loading to the creek at this location.

Comment Number	Reference	Comment
30.	Page 8-5 and 8-9	The GWLF model was developed to assess point and nonpoint loadings of nitrogen and phosphorus from urban and agricultural watersheds. The current version of this model does not account for loadings of toxics and metals (USEPA, 1997). Therefore, GWLF is not considered a good watershed model to quantify metal loads from nonpoint sources in Peak Creek Watershed. Is there a rationale why GWLF was selected during the model selection process? Since HSPF has already been applied to quantify the fecal bacteria loads from nonpoint sources in Peak Creek, is there any particular reason that precludes the use of HSPF to quantify metal loading as well?
31.	Page 8-19	"Hydrologic calibration was not performed for Peak Creek, as no suitable stream flow data existed within or nearby the watershed". This was also an issue for the companion TMDL for fecal coliform, but in that case instantaneous flow measurements were used. Can instantaneous flow measurements be used for the general standard (benthic) TMDL to generate simple calibration results such as those shown in Figure 4.6 and 4.7 and discussed in section 4.6.1 for the fecal bacteria TMDL?

Comment Number	Reference	Comment
32.	Page 8-20	Section 8.3 states: "Combining the results of the sediment-loading model with *anticipated* concentrations of Cu and Zn from the sources discussed in Section 8.1, concentrations of Cu and Zn in the stream sediments *were modeled and calibrated* to the median concentrations observed at ambient monitoring stations that coincide with the outlets of Model Segment 2 and 3 (Table 8.10). The resulting, *calibrated enrichment ratios* for Cu and Zn delivered from the contaminate site at Allied Signal were 3.7 and 4.2, respectively". Overall, Section 8.3 lacks sufficient supporting details to Table 8.10, which is one of the most important tables in this draft TMDL document. Is it possible to elaborate the exact meaning and technical basis for "anticipated concentrations of Cu and Zn"? Is it possible to show model calibration graph and provide description of goodness-of-fit of model output to field data? It is unclear how the procedure of generating "calibrated enrichment ratios" was performed. Is it possible to elaborate the major steps and key model parameters during the calibration process? What is the "calibrated enrichment ratio" for other potential sources/sites in the Peak Creek Watershed? The results of the sediment loading model with model-generated soil concentration input values equal to or greater than an order of magnitude greater than site-specific should be viewed with caution. Particularly when the loads modeled as being delivered from the Allied Signal site are an order of magnitude greater than the loads from any other site.
33.	Page 8-20	The draft benthic TMDL utilized a simple mass balance in-stream water quality framework to link with watershed model GWLF. The benthic impairment due to metals in contaminated sediment has many inter-related processes in-stream. A simple mass balance equation may not be sufficient to describe the important and complex fate and transport processes in both impaired and reference watersheds. Again, the ambient biological responses to metal loading in contaminated sediment between impaired and reference watersheds could be quite different, even when their land-based pollutant loading is the same. Therefore, without using an appropriate in-stream model to quantify the ambient impact/response, the expected improvement in Peak Creek may or may not be achieved based on calculated values shown in TMDL allocation table.
34.	Table 9.3	The table and the accompanying text are inconsistent. Please reconcile.

<u>References:</u>

Booth, 1991. Urbanization and the natural drainage system-impacts, solutions and prognoses, Northwest Environmental Journal, 93-118.

Booth and Reinelt, 1993. Consequences of Urbanization on Aquatic Systems- measured effects, degradation thresholds, and corrective strategies, pp. 545-550, Proceedings Watershed '93 A National Conference on Watershed Management, March 21-24, 1993, Alexandria, Virginia.

Boward et al, 1999. From the Mountains to the Sea: The State of Maryland's Freshwater Streams, EPA 903-R-99-023.

County of Fairfax, 1999. Stream Protection Strategy, Baseline Study.

Moeykens, 2002. Studies of Benthic Macroinvertebrate Use for Biomonitoring of Mid-Atlantic Highland Streams, Dissertation submitted to Virginia Polytechnic Institute and State University, May 10, 2202.

Roy F. Weston, Inc., 1998. Trip Report for the Allied-Pulaski Site, Pulaski, Pulaski County, Virginia. December 9, 1998. Prepared for USEPA.

USEPA, 1997. Compendium of Tools for Watershed Assessment and TMDL Development, EPA 841-B-97-006, Washington DC

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USEPA, 1998. Guidelines for Ecological Risk Assessment, EPA/630/R-95/002F, April 1998.

VDEQ, 1998. Brownfields Site Screening Report, McCready Lumber (BFP-003), Town of Pulaski, Virginia. September 21, 1998

April 26, 2004

David W. Rundgren
New River Valley Planning District Commission
6580 Valley Center Drive, Box 21
Radford, Virginia 24141

Re. Commission Comment on Peak Creek, Crab Creek, and Back Creek Draft TMDLs

Dear Mr. Rundgren:

Thank you for your email regarding the TMDL studies on Peak Creek, Crab Creek, and Back Creek. The Commission makes a valid point concerning wildlife contributions to bacteria loads and the impact on allocation scenarios. I have attempted to provide an answer to the Commission's concerns. Please contact me at (540)-562-6724 if there are anymore questions. Thank you for your participation and I look forward to working with the commission on the implementation plan.

Your email states: “None of the recommended implementations plans call for a reduction to be associated with wildlife” and "The Commission encourages that an allocation be made for reduction in the wildlife contribution, allowing a reduction in livestock allocations". This is a valid concern. However, Virginia Department of Environmental Quality (VDEQ) believes that water quality improvements monies in the first stage goals should be focused on man caused sources of pollution. VDEQ's goal is not to reduce wildlife populations or change natural background conditions. Managing overpopulated nuisance wildlife species does remain an option for local governments and stakeholders in the watershed. Any reductions in the bacteria loads will be credited in the implementation plan, but at this point with only limited water quality improvement funds providing cost share monies to control man caused sources of pollution is VDEQ's priority.

Sincerely,

Jason R. Hill

Jason R. Hill
Regional TMDL Coordinator

cc: Jutta Schneider, Department of Environmental Quality
Greg Anderson, Department of Environmental Quality
Jim Kern, MapTech, Inc.

April 29, 2004

Sarah Meyers
Parsons
10521 Rosehaven Street
Fairfax, VA 22030

Re. Comments on the Draft Total Maximum Daily Load (TMDL) Report for Peak Creek, March 2004

Dear Ms. Meyers:

Thank you for your emails and comments regarding the TMDL study on Peak Creek. Parson's (on behalf of Honeywell International, Inc.) makes several valid points concerning the biological TMDL report, which have been addressed in this letter and the draft document. The Virginia Department of Environmental Quality (VADEQ) and MapTech, Inc. have attempted to provide an answer to all of Parson's concerns in the enclosure attached to this letter. Please contact me at (540)-562-6724 if there are anymore questions. Thank you for your participation and I look forward to working with you on the implementation plan.

Sincerely,

Jason R. Hill
Regional TMDL Coordinator

cc: Jutta Schneider, Virginia Department of Environmental Quality
Beth Lohman, Virginia Department of Environmental Quality
Greg Anderson, Virginia Department of Environmental Quality
Jim Kern, MapTech, Inc.

enclosures

<u>Response to Comments from Parsons</u>

Comment 1 Response:

The document text is describing how the impairment was established by VADEQ and this was according to the Rapid Bioassessment Protocol II (RBP). The biological assessment methodology currently used in Virginia to determined impaired streams is the RBP II, which does require a reference station (EPA, 1999). Virginia has a new tool for evaluating impaired streams, which is known as the Stream Condition Index (SCI). It is a multimetric index based on state ecoregional reference stations and does not require a reference station. The SCI will be used in the future to determine biological integrity of state waters and therefore is currently used in TMDL reports to corroborate RBP II assessments. The text in the draft document was confusing and has been updated. The SCI report (TetraTech, 2003) has been attached to the email for further information. **(Document revised as requested by VADEQ, Jason Hill and Jutta Schneider)**

Comment 2 Response:

The Ecological Data Application System (EDAS) database refers to station PKC007.80 and the ambient monitoring station refers to station PKC007.82. VADEQ collects ambient monitoring data at bridges for access and safety reasons. Some of these sites also serve as biological monitoring stations. If there is not a suitable riffle at the bridge the biologist uses the closest one whether it’s upstream or downstream. In the past, the regional biologists have created their own river miles and the planning staff created ambient river miles. Different people creating similar river miles have resulted in slight river mile variations.

The biological station is upstream of the ambient chemical station by around 100 feet. Since there is not a significant discharge, tributary or land use change within the 100 feet between these stations the water chemistry is the same. (**No change to document**)

Comment 3 Response:

(Paragraph 1) If a causal relationship had been proven the term “probable stressor” would not be used. The word “probable” *is* the qualifier. (**Additional verbiage and references in section 7.1.3.1 to support metal toxicity**)

(Paragraph 2) The text in question reads, ***“Some evidence exists that organic matter should be considered as a possible stressor. It is anticipated that reductions will occur in the primary sources of organic matter via implementation of the fecal bacteria TMDL developed for Peak Creek”.*** Organic matter was not eliminated as a possible stressor; it was included as a potential stressor. Ammonia is given as an example that should be considered and it was considered specifically in section 7.1.1.5. **(No change to document)**

Comment 4 Response:

It is true Virginia does not have water quality standards for metal concentrations in the sediment. Probable Effect Concentration (PECs) are used by VADEQ staff to list 'waters of concern' for metal concentrations in the sediment and provide a guideline to be used in biological TMDL stressor anaylsis. The reference stream used in the report to set the allocations was actually in Peak Creek, which takes into account background levels in the watershed. Bottom line, below the Allied site, VADEQ data shows the median copper and zinc concentrations in the sediment are in 99^{th} percentile statewide (Tingler, 1990) **(No change to document)**

Comment 5 Response:

(Paragraph 1) An ecological system, such as the benthic community in a freshwater stream is complex by nature and assessment scores will depend on many factors and often be highly variable. However, a median SCI score of 65 for the reference station is significantly different than the median SCI score of 25 at the station below the Allied site. **(no change to document)**

(Paragraph 2) (Additional verbiage and references in section 7.1.3.1 to support metal toxicity)

(Paragraph 3 & 4) The text is mistaken; the SCI scores are generally *lower* in the fall than in the spring. Mood’s Median Test was run on all data from Peak Creek and the seasonal variation in SCI scores is significant ($p = 0.015$). When data from 2000-2003 was deleted from the data set the seasonality became even more pronounced ($p = 0.009$), implying that the drought decreased the degree of seasonality. Many studies, such as the Fairfax Study mentioned in the report, document the fact urbanization is detrimental to the benthic community. In the Peak Creek watershed, the land cover data indicates urbanization is less than 5% of the watershed. This can have a significant impact on the benthic community and it is discussed in the report. Urbanization usually severely degrades the benthic community at levels between 10-20% of the watershed (variability depends on watershed, topography, gradient, etc.). Urbanization degrades the benthic community by destroying the benthic habitat (i.e. increasing loads of fine sediments, nutrients, and altering the hydrology. However, in Peak Creek nutrient levels are low and the habitat scores are similar to reference condition. In fact, the habitat scores at the lower Peak Creek station are better than our ecoregional reference station on Tom's Creek. VADEQ feels that habitat score would be much lower if urbanization was a stressor. Therefore, the most probable stressor to the benthic community was identified as the high metal concentrations in the sediment. **(Correction and addition to Peak Creek document)**

(Paragraph 5) Maptech can add a statement saying that Peak Creek scores are better now than in the early 1990s, the regional biologist feels the volunteer capping of the Allied Site was the reason for this improvement. However, this cap is showing signs of wear and still does not have a vegetative buffer to stop erosion off the site.

Comment 6 Response:

Table 7.1 one has been updated in the report to more closely resemble the table included in the fecal coliform TMDL (comment 28). However, six of the eight permit limits were not 'being substantially exceeded'. The Discharge Monitoring Reports (DMR) from the last ten years show the Magnox facility complies with its permit limit for copper 100% of the time and zinc 97% of the time. The average monthly loading concentrations from the permit limit are used to calculate the Waste Load Allocations, not DMR data. This is how all TMDL WLA's are calculated. **(No change to document)**

Comment 7 Response:

As described in Section 8.1.1 of the document, runoff from all urban impervious surfaces (including the parking lot above the Allied Signal site) was modeled using median Event-Mean-Concentrations (EMCs) observed during the National Urban Runoff Program (EPA, 1983). These concentrations (*i.e.*, 43 μg-Cu/l and 228 μg-Zn/l) were combined with average annual runoff volumes, as calculated by the GWLF model, from urban impervious surfaces to calculate an annual load. **(No change to document)**

Comment 8 Response:

The reference station for an RBP II survey always computes to 100% therefore putting this information for 9-PKC011.11 in figure 7.2 and table 7.3 is unnecessary. **(No change to document)**

Comment 9 Response:

Unless otherwise indicated the "X" axis is obviously "Date". **(No change to document)**

Comment 10 Response:

The caption for Figure 6.7 has been corrected.

Comment 11 Response:

The "error message" has been removed. **(Correction and addition to Peak Creek document)**

Comment 12 Response:

The monitoring stations are ordered consistently and clearly by DEQ river mile from downstream to upstream. **(No change to document)**

Comment 13 Response:

A map for Table 7.5 has been provided. **(Correction and addition to Peak Creek document)**

Comment 14 Response:

See response for comment #12. **(No change to document)**

Comment 15 Response:

Not all of DEQ's special study data is available on the DEQ Web site. That's why the data you referenced was provided to you by DEQ in hard copy, Peak Creek Sediment Metals, November 1989 by Larry D. Willis. **(No change to document)**

Comment 16 Response:

See response for comment #15. **(No change to document)**

Comment 17 Response:

Figure 7.2.1 has been corrected. Also see response to comment #2. **(Correction and addition to Peak Creek document)**

Comment 18 Response:

See response for comment #2. **(No change to document)**

Comment 19 Response:

The numbers in the text have been corrected. **(Correction and addition to Peak Creek document)**

Comment 20 Response:

The VADEQ does not have sediment metal water quality standards. VADEQ regulates permitted facilities using 'dissolved metal' standards. The 'dissolved metals' in Peak Creek are low and do not violate the water quality standard. However, the copper and zinc levels found at VADEQ monitoring stations are elevated in the sediment. These concentrations are in the 99^{th} percentile statewide. The copper and zinc values found in the sediment at Peak Creek exceed the PEC levels and these levels can be harmful to aquatic organisms. After evaluating all available water quality data, it was decided the elevated copper and zinc levels represented the 'most probable stressor' to the benthic community. Since Virginia has no applicable water quality standard to model directly, the reference watershed approach was used to develop watershed management goals. This methodology was submitted and approved by EPA. **(No change to document)**

Comment 21 Response:

Figure added. **(Correction and addition to Peak Creek document)**

Comment 22 Response:

McCready Lumber's old facility borders the Allied site. According to the VADEQ waste and water inspection staff, the past activities at the McCready lumber do not represent a concern as a possible source of contamination for Peak Creek. McCready Lumber stopped manufacturing at their old site beside the Allied property and reopened in another part of town in 1990. In 1998, McCready Lumber yard entered the Virginia Voluntary Remediation Program (VRP) in order to receive a "certification of satisfactory completion of remediation." However, evaluation of the McCready Lumber site made it difficult for VADEQ to issue a certificate for the entire site. According to the Brownfield report (VADEQ 1998) "Analysis of the surface soil samples indicate the presence of high levels of metal concentrations representative of contaminants found at the upgradient Allied facility" and "Contaminants detected in ground-water samples are indicative of the Allied facility." [A copy of this report could be provided upon request.] The the current waste compliance and water inspection staff at VADEQ maintains the McCready Lumber runs one of the cleanest lumber operations in the region.

The VADEQ metals data set has been taken over several years and shows repeatedly that the copper and zinc levels in Peak Creek are highly elevated compared to other streams and rivers in Virginia. Using a median to describe the data set is a conservative approach since median values are *not* influenced by 'outlier' values. **(No change to document)**

Comment 23 Response:

It appears that Parson's may be confusing "Mean" with "Median".

Sediment Zinc (mg/Kg)

	PKC 7.82	PKC 9.29	PKC 11.11
Median	1,615	932.5	828.5
Mean	1,687.33	940.75	1,081.66

The one really high value at PKC011.11 does cause the mean to be higher than station PKC009.29. The median values clearly increase as you move downstream. **(No change to document)**

Comment 24 Response:

The data for the metal concentrations in question are taken from Table 5.3 of the October 2002 Honeywell report. There are small differences in the numbers caused by converting concentration units from mg/L to mol/L for use in the speciation model. When equilibrium calculations are completed the model software then converts concentrations back to mg/L for convenience in reporting. The small differences are due to rounding errors and, given the purpose of the analysis, are irrelevant. **(No change to document)**

Comment 25 Response:

Surface water runoff volumes were calculated using the GWLF model. Input data for these calculations are described in Sections 8.2.3.2 and 8.2.3.7. **(No change to document)**

Comment 26 Response:

The amount of data available from the Moeykens study was limited (*i.e.*, four sample events), and was not collected under a VADEQ approved Quality Assurance Project Plan. This type of data can be used qualitatively, but not quantitatively in a TMDL study. Looking at the data qualitatively, the concentrations seen are consistent with those measured at the reference site. The loads modeled from upstream sources are reflective of these concentrations. **(No change to document)**

Comment 27 Response:

The Pulaski sewage treatment plant (STP) has been closed for over twenty years. When the facility was closed, the Virginia Department of Health made that all sludge waste was removed from the site. There is no indications that the Pulaski STP ever contributed significant copper or zinc to the watershed. **(No change to document).**

Comment 28 Response:

The only permitted discharger with available monitored data was the Magnox facility. Two other dischargers are permitted for control of metals (*i.e.*, Gem City Iron and Metal is permitted for copper and zinc, and McCready Lumber is permitted for copper) under a general permit. Under the general permit, dischargers are expected to report exceedances of 'monitoring cuttoff' limits (*i.e.*, 18 ug/L for copper and 120 ug/L for zinc). Since no exceedances have been reported, the loads from these dischargers were considered to be insignificant as compared to all other sources. However, loads based on the monitoring cuttoff limits have been included in the allocation. **(No change to document)**

Comment 29 Response:

(Paragraph 1) The method applied for estimating the concentration of metals in sediment leaving the Allied Signal site incorporated data collected throughout the site, while the suggested values were measured in one location where contaminated soils had been capped. Additionally, as described in the sensitivity analysis provided, any change to these values would necessitate increasing the loads somewhere else in the model to maintain the calibration. Since the Allied Signal site is known to have soils contaminated with copper and zinc, as well as acidic conditions, which would increase the opportunity for delivery of metals to the stream, it makes more sense to calibrate the loads from this source than from other sources where there is no evidence that metal concentrations should be significantly increased. **(No change to document)**

(Paragraph 2 and 3) Currently, the use of “actual” data would be based on a single observation of runoff from a 30-acre site. If more data were available (*e.g.*, long-term monitoring of surface and subsurface delivery of metals from the site to the stream) then the use of “actual” data would be warranted, and the reduction of uncertainty, with regard to delivery of metals from the site, might make the calibration process a mute point. Given the current prevalence of in-stream data versus on-site data, calibration was considered a necessary component of the modeling process. **(No change to document)**

Comment 30 Response:

The GWLF model was used to calculate long-term average sediment loads from the various source areas in the watershed. As described in the document, metals in the stream sediment were modeled in a post-process, with a mass-balance model. The use of GWLF for modeling sediment loads for TMDLs is well established. Sediment deposition is a long-term process, which is most appropriately modeled with a loading model, such as GWLF. **(No change to document)**

Comment 31 Response:

Instantaneous measures of flow are not useful in calibrating GWLF, since GWLF is not a "continuous" model in the sense that HSPF is. Flow values estimated at a monthly or annual timestep can be quite accurate, but there is considerably less confidence in flow values estimated at shorter timesteps (particularly approaching instantaneous). Since GWLF was designed for use in ungaged watersheds, this was not viewed as a concern. **(No change to document)**

Comment 32 Response:

The anticipated concentrations of metals in sediment and runoff from source areas are described in Section 8.1.1. The mass-balance model is fully described by the equations presented in this section. The model was designed to calculate long-term equilibrium concentrations of copper and zinc in stream sediment. A single value of copper and zinc concentrations is calculated at each modeled segment outlet. The existing median concentrations of copper and zinc are given in Table 8.1. The enrichment ratios for metals delivered from the Allied Signal site were adjusted until the resulting concentrations in stream sediment were equal to the values presented in Table 8.1. Given the nature of the model, calibration graphs and goodness-of-fit parameters are meaningless. **(No change to document)**

Comment 33 Response:

Models are, by their nature simplifications of more complex processes. Since there is no evidence of continued build-up of sediment in the stream, the assumption that stream sediment deposition and removal is in a steady-state condition was considered valid. Given the amount and type of data available to support modeling, as well as the intended use of the model, the modeling approach applied was viewed as being adequate. **(No change to document)**

Comment 34 Response:

Table 9.3 has been updated to include permitted loads from Gem City Iron and Metal , and McCready Lumber. The accompanying text has been corrected. **(Correction and addition to Peak Creek document)**

Response to comments on the sensitivity analysis provided by MapTech:

The comments provided by Parsons on the sensitivity are largely addressed in the responses above, particularly in numbers 26 and 29. Regarding the selection of background concentrations, Parsons has provided an additional literature source for these concentrations, but no additional site-specific data. Median values were used in this study because they are representative of spatially averaged data, and are not biased by extreme values in the dataset. **(No change to document)**

References

TetraTech. 2003. A Stream Condition Index for Virginia Non-Coastal Streams.

Tingler , J.N. et. al. 1990. Comprehensive Review of Selected Toxic Substances-Environmental Samples In Virginia State Water Control Board-Bulletin 583. Richmond, Virginia.

USEPA. 1999. Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers. EPA 841-B-99-002.

VADEQ. 1998. Brownfields Site Screening Report, McCready Lumber (BRP-003), Town of Pulaski, Virginia. September 21, 1998.

Willis, Larry D. 1989. Peak Creek Sediment Metals. Virginia Department of Environmental Quality Memo.